

**WHAT IS CLAIMED IS:**

1. A series variable attenuation device comprising:
  - a resistive array having two or more input nodes, two or more output nodes, and two or more resistive devices for coupling the input nodes and the output nodes;
  - a first switch having an input terminal and two or more selectable output terminals; wherein the input terminal is configured to receive an input signal and the two or more selectable output terminals are coupled to the two or more input nodes of the resistive array; and
  - a second switch having two or more selectable input terminals and an output terminal; wherein the output terminal is configured to provide an attenuated output signal and the two or more selectable input terminals are coupled to the two or more output nodes of the resistive array;
  - wherein the output terminal selected on the first switch and the input terminal selected on the second switch varies the resistance seen by the input signal, and the values of the two or more resistive devices are configured to allow for substantially-uniform attenuation steps of the input signal.
2. The device of claim 1 wherein the first switch includes a discrete switching device coupled to each of the selectable output terminals.
3. The device of claim 2 wherein each discrete switching device includes one or more transistors.
4. The device of claim 3 wherein the transistor is a discrete transistor.
5. The device of claim 3 wherein the transistor is formed in a semiconductor substrate.

6. The device of claim 1 wherein the second switch includes a discrete switching device coupled to each of the selectable input terminals.
7. The device of claim 6 wherein each discrete switching device includes one or more transistors.
8. The device of claim 7 wherein the transistor is a discrete transistor.
9. The device of claim 7 wherein the transistor is formed in a semiconductor substrate.
10. The device of claim 1 wherein the input signal is an RF signal.
11. The device of claim 1 wherein the resistive devices are discrete resistors.
12. The device of claim 1 wherein the resistive devices are formed with resistive material deposited on one of a semiconductor substrate, a dielectric substrate, and an insulating substrate.
13. The device of claim 1 wherein the resistive array is a planar resistive array.
14. The device of claim 13 wherein the planar resistive array is formed with resistive material deposited on one of a semiconductor substrate, a dielectric substrate, and an insulating substrate.
15. The device of claim 1 further comprising:
  - a first shunt resistance for coupling the input terminal of the first switch to a ground; and
  - a second shunt resistance for coupling the output terminal of the second switch to the ground.
16. The device of claim 1 wherein at least one of the resistive devices of the resistive

array connects two of the input nodes of the resistive array.

17. The device of claim 1 wherein at least one of the resistive devices of the resistive array connects one of the input nodes to one of the output nodes of the resistive array.

18. The device of claim 1 wherein the first and second switches are reflective switches.

19. A dual-switch shunt variable attenuation device comprising:
- a resistive array having two or more input nodes, two or more output nodes, and two or more resistive devices for coupling the input nodes and the output nodes;
  - a first switch having an input terminal and two or more selectable output terminals; wherein the input terminal is configured to receive an input signal and the two or more selectable output terminals are coupled to the two or more input nodes of the resistive array; and
  - a second switch having two or more selectable input terminals and an output terminal; wherein the output terminal is coupled to a ground and the two or more selectable input terminals are coupled to the two or more output nodes of the resistive array;
- wherein the output terminal selected on the first switch and the input terminal selected on the second switch varies the resistance seen by the input signal, and the values of the two or more resistive devices are configured to allow for substantially-uniform attenuation steps of the input signal.
20. The device of claim 19 wherein the first switch includes a discrete switching device coupled to each of the selectable output terminals.
21. The device of claim 20 wherein each discrete switching device includes one or more transistors formed in a semiconductor substrate.
22. The device of claim 19 wherein the second switch includes a discrete switching device coupled to each of the selectable input terminals.
23. The device of claim 22 wherein each discrete switching device includes one or more transistors formed in a semiconductor substrate.
24. The device of claim 19 wherein the input signal is an RF signal.

25. The device of claim 19 wherein the resistive array is a planar resistive array.
26. The device of claim 25 wherein the planar resistive array is formed with resistive material deposited on one of a semiconductor substrate, a dielectric substrate, and an insulating substrate.
27. The device of claim 19 wherein at least one of the resistive devices of the resistive array connects two of the input nodes of the resistive array.
28. The device of claim 19 wherein at least one of the resistive devices of the resistive array connects one of the input nodes to one of the output nodes of the resistive array.

29. A single-switch shunt variable attenuation device comprising:
- a resistive array having two or more input nodes, two or more output nodes coupled to a ground, and two or more resistive devices for coupling the input nodes and the output nodes; and
  - a first switch having an input terminal and two or more selectable output terminals; wherein the input terminal is configured to receive an input signal and the two or more selectable output terminals are coupled to the two or more input nodes of the resistive array;
  - wherein the output terminal selected on the first switch varies the resistance seen by the input signal, and the values of the two or more resistive devices are configured to allow for substantially-uniform attenuation steps of the input signal.
30. The device of claim 29 wherein the first switch includes a discrete switching device coupled to each of the selectable output terminals.
31. The device of claim 30 wherein each discrete switching device is a transistor formed in a semiconductor substrate.
32. The device of claim 29 wherein the input signal is an RF signal.
33. The device of claim 29 wherein the resistive array is a planar resistive array.
34. The device of claim 33 wherein the planar resistive array is formed with resistive material deposited on one of a semiconductor substrate, a dielectric substrate, and an insulating substrate.
35. The device of claim 29 wherein at least one of the resistive devices of the resistive array connects two of the input nodes of the resistive array.
36. The device of claim 29 wherein at least one of the resistive devices of the resistive

array connects one of the input nodes to one of the output nodes of the resistive array.

37. A signal splitting system comprising:
- a signal splitting device for receiving an input signal on an input port and providing essentially equal output signals on each of a plurality of output ports; and
  - a variable attenuation device, coupled to at least one of the output ports of the signal splitting device, comprising:
    - a resistive array having two or more input nodes, two or more output nodes, and two or more resistive devices for coupling the input nodes and the output nodes;
    - a first switch having an input terminal and two or more selectable output terminals; wherein the input terminal is configured to receive the output signal of the signal splitting device, and the two or more selectable output terminals are coupled to the two or more input nodes of the resistive array; and
    - a second switch having two or more selectable input terminals and an output terminal; wherein the output terminal is configured to provide an attenuated output signal and the two or more selectable input terminals are coupled to the two or more output nodes of the resistive array;
- wherein the output terminal selected on the first switch and the input terminal selected on the second switch varies the resistance seen by the output signal of the signal splitting device, and the values of the two or more resistive devices are configured to allow for substantially-uniform attenuation steps of the output signal of the signal splitting device.
38. The system of claim 37 wherein the first switch includes a discrete switching device coupled to each of the selectable output terminals.
39. The system of claim 37 wherein the second switch includes a discrete switching

device coupled to each of the selectable input terminals.

40. The system of claim 37 wherein the input signal is an RF signal.

41. The system of claim 37 wherein the resistive array is a planar resistive array.

42. The system of claim 41 wherein the planar resistive array is formed with resistive material deposited on one of a semiconductor substrate, a dielectric substrate, and an insulating substrate.

43. The system of claim 37 wherein at least one of the resistive devices of the resistive array connects two of the input nodes of the resistive array.

44. The system of claim 37 wherein at least one of the resistive devices of the resistive array connects one of the input nodes to one of the output nodes of the resistive array.

45. A signal attenuation system comprising:

a low-resolution signal attenuation device for receiving an input signal on an input port and providing a coarsely-attenuated output signal on an output port, wherein the low-resolution signal attenuation device is configured to attenuate the input signal in coarse attenuation steps; and

a high-resolution signal attenuation device, coupled to the output port of the low-resolution signal attenuation device, comprising:

a resistive array having two or more input nodes, two or more output nodes, and two or more resistive devices for coupling the input nodes and the output nodes;

a first switch having an input terminal and two or more selectable output terminals; wherein the input terminal is configured to receive the coarsely-attenuated output signal of the low-resolution signal attenuation device, and the two or more selectable output terminals are coupled to the two or more input nodes of the resistive array; and

a second switch having two or more selectable input terminals and an output terminal; wherein the output terminal is configured to provide a finely-attenuated output signal and the two or more selectable input terminals are coupled to the two or more output nodes of the resistive array;

wherein the output terminal selected on the first switch and the input terminal selected on the second switch varies the resistance seen by the coarsely-attenuated output signal of the low-resolution signal attenuation device, and the values of the two or more resistive devices are configured to allow for substantially-uniform fine attenuation steps of the coarsely-attenuated output signal of the low-resolution signal attenuation device.

46. The system of claim 45 wherein the low-resolution signal attenuation device one of a PIN diode attenuator and a voltage-variable analog attenuator.

47. The system of claim 45 wherein the low-resolution signal attenuation device is switched-bit digital attenuator.

48. The system of claim 45 wherein the input signal is an RF signal.

49. The system of claim 45 wherein the resistive array is a planar resistive array.

50. The system of claim 49 wherein the planar resistive array is formed with resistive material deposited on one of a semiconductor substrate, a dielectric substrate, and an insulating substrate.

51. The system of claim 45 wherein at least one of the resistive devices of the resistive array connects two of the input nodes of the resistive array.

52. The system of claim 45 wherein at least one of the resistive devices of the resistive array connects one of the input nodes to one of the output nodes of the resistive array.

53. The system of claim 45 wherein the coarse attenuation step is substantially equal to 0.50 decibels.

54. The system of claim 45 wherein the fine attenuation step is substantially equal to 0.05 decibels.

55. A testing system comprising:

a device-under-test having an input port configured to receive a test signal;

and

a variable attenuation device comprising:

a resistive array having two or more input nodes, two or more output nodes, and two or more resistive devices for coupling the input nodes and the output nodes;

a first switch having an input terminal and two or more selectable output terminals; wherein the input terminal is configured to receive an input signal, and the two or more selectable output terminals are coupled to the two or more input nodes of the resistive array; and

a second switch having two or more selectable input terminals and an output terminal; wherein the output terminal is configured to provide the test signal to the device-under-test, and the two or more selectable input terminals are coupled to the two or more output nodes of the resistive array;

wherein the output terminal selected on the first switch and the input terminal selected on the second switch varies the resistance seen by the input signal, and the values of the two or more resistive devices are configured to allow for substantially-uniform attenuation steps of the input signal.

56. The system of claim 55 wherein the input signal is an RF signal.

57. The system of claim 55 wherein the resistive array is a planar resistive array.

58. The system of claim 57 wherein the planar resistive array is formed with resistive material deposited on one of a semiconductor substrate, a dielectric substrate, and an

insulating substrate.

59. The system of claim 55 wherein at least one of the resistive devices of the resistive array connects two of the input nodes of the resistive array.

60. The system of claim 55 wherein at least one of the resistive devices of the resistive array connects one of the input nodes to one of the output nodes of the resistive array.